|  |  |  |  |
| --- | --- | --- | --- |
| **ST. JOSEPH’S UNIVERSITY, BANGALORE-27** |
| **BCA- II SEMESTER** |
| **SEMESTER EXAMINATION: APRIL 2023**(Examination conducted in May 2023) |
| **CA2121- DATA STRUCTURES USING C** |
| **Time- 2 Hrs.** |  |  **Max Marks-60** |

| **NOTE:** There are **THREE** sections in the question paper carrying 10, 20 and 30  marks each.  |
| --- |
| **SECTION A****Answer any FIVE of the following questions                              (5\*2=10 marks)** |
| **Q1.** | Declare a data type to represent the node of a LINKED list having integer data item. Write a function program to initialize the Head of the linked list. | 2 |
| **Q2.** | Create a BST from the order of the numbers given below. Give the PREORDER traversal of the BST. **60, 40, 70, 30, 35, 80, 75, 65** | 2 |
| **Q3.** | Convert the following INFIX expression into POSTFIX expression using a STACK. **( A+B – C)^2 – (D –E\*3)/F** | 2 |
| **Q4.** | What do you mean by Data Structures? With examples show how linear data structures differ from non-linear data structures.  | 2 |
| **Q5.** | Explain the meaning of Big-O notation to assess the complexity of an algorithm. | 2 |
| **Q6.** | Mention four uses of stack data structure. | 2 |
| **SECTION B** |
| **Answer any FIVE of the following ( 5x4=20)** |
| **Q7.** | Given the recurrence formula below, calculate the complexity of the algorithm represented by the recurrence formula. T(n) = T(N-1) + 1 for n>0 T(0) = 1 | 4 |
| **Q8** | Write a program in C to input some numbers into an array and sort them using **BUBBLE SORT** technique. | 4 |
| **Q9.** | Declare **a data type** to represent the node of a **Linked list** and write a function subprogram to return the **maximum number** in the linked list. | 4 |
| **Q10.** | Declare a data type to represent the node of a **Queue** and if **Front** and **Rear** are the global pointers representing the head and tail of a Queue having integer data item. Write a function subprogram **Dequeue()** to delete the first number from the Queue. | 4 |
| **Q11.** | What is a **SPARSE MATRIX**? With an example show how it ca be implemented using a linked list. | 4 |
| **Q12** | Give algorithm to insert a node into an ordered **DOUBLY LINKED LIST**. | 4 |
| **SECTION C** |
| **Answer any THREE of the following (3x10=30)** |
| **Q13.** | 1. Create a **Binary Search Tree** (BST) from the **POSTORDER** traversal given below. Show steps involved. How many leaf nodes are there in this tree? And what is the height of the BST? **3, 8, 9, 7, 12, 17, 15, 10**

b) Declare a new data type to represent a STACK. What is the acronym associated with a stack? Show how this is implemented by writing CODE to implement Push() and POP() functions. | 46 |
| **Q14.** | 1. Show how a **stack** can be used to evaluate the following POSTFIX expression: **12, 5, -, 2, 4, \*, +, 5, /, 3, 2, +, 2, ^, +**

**b**) Write a function program to search for a given number using **BINARY** **search**. Let it return 1 if the number is found or else return 0. What is the condition for using binary search? Which searching method is efficient? Linear or Binary? Why? | 47 |
| **Q15.** | How do you create a new data type to represent the node of a circular queue? Write a menu driven program to show the working of a **CIRCULAR QUEUE** with the following options: 1) Insert a number (Enqueue) 2) Delete the first node (Dequeue ) 3) Display queue 4) EXIT | 10 |
| **Q16.** | 1. Given the precedence of operators [ “(“ :1, “)”2, +,-:3, \*,/: 4, ^: 5 ] write a function sub program to return the precedence of a given operator.
2. Create a new data type to represent the node of a **BST** known as **TREENODE** having integer data item and two links to right and left sub trees. Write function subprograms to **insert** a number into the BST, and recursive functions to do **INORDER** traversal.
 | **4****6** |
|  |  |  |